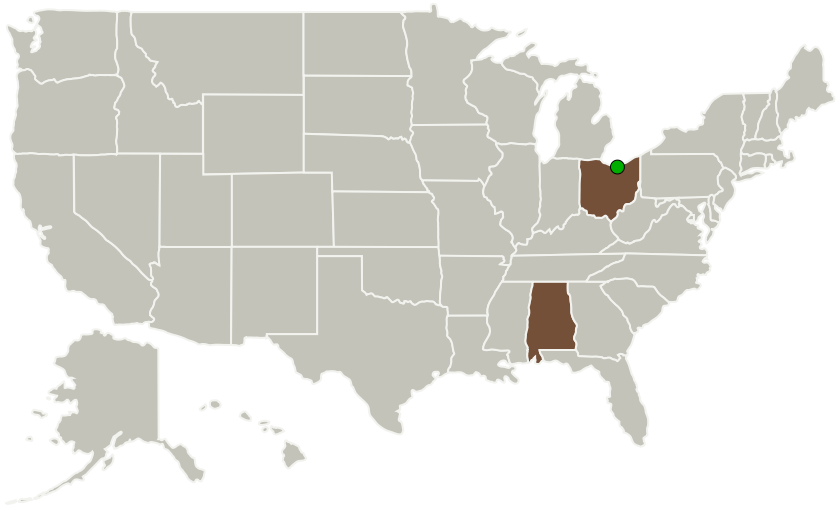
Low-Cost Manufacturing Technique for Advanced Regenerative Cooling for In-Space Cryogenic Engines, Phase I

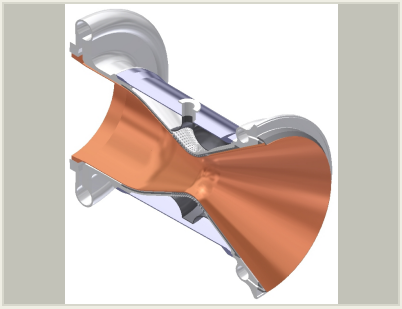
Completed Technology Project (2013 - 2013)

Project Introduction

The goal of the proposed effort is to demonstrate feasibility of using selective laser melting (SLM, an emerging manufacturing technique) to manufacture a subscale combustion chamber liner that features an advanced regenerative cooling technique that combines high performance with low pressure drop. SLM enables the ability to "print" the advanced regenerative liner in mere hours, despite the liner's inherent flow passage complexity. This reduction in manufacturing lead time, combined with the fact that SLM manufacturing costs are driven almost exclusively by the amount of raw powder used during fabrication, results in a substantial cost reduction for future regeneratively-cooled rocket engines. Considering that the proposed regenerative cooling approach features heat transfer coefficients 3-10 times higher and pressure drops 2-10 times lower than traditional axial channels, the proposed effort demonstrate one of the highest performing, lowest cost combustion chambers in the world.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Analytical Services, Inc. (ASI)	Lead Organization	Industry Small Disadvantaged Business (SDB)	Huntsville, Alabama
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Alabama	Ohio

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140392)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Analytical Services, Inc. (ASI)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

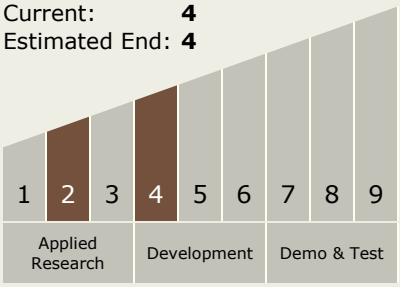
Carlos Torrez

Principal Investigator:

Thomas K Haymond

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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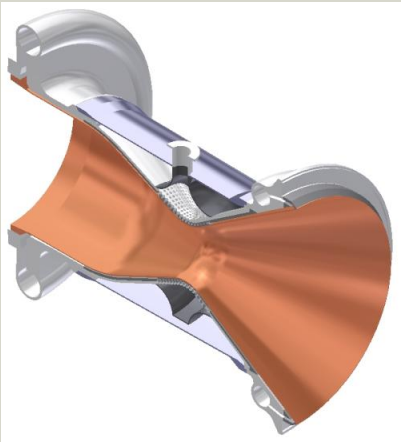
Images



Project Image
Low-Cost Manufacturing Technique for Advanced Regenerative Cooling for In-Space Cryogenic Engines
(https://techport.nasa.gov/image/134191)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System